

2003 Networking Conference - “Arts Pay Big Dividends: Diversify Your Portfolio”

**Integrating the Art of Color, Tessellations and Technique
With the World of Mathematics
(Grades 3 – 4)**

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Lesson Plan: Tessellating Patterns

Lesson Goals –

In Life Skills: Complex Thinking – Students demonstrate a variety of thinking processes, integrate new information with existing knowledge and experience, apply thinking skills strategically.

In Math: Students reason mathematically, make mathematical connections, and demonstrate a positive learning attitude toward mathematics.

In Arts Learning: Students improve their art making skills, express ideas, and explore their imaginations through art.

Core Learning Targets –

In Math: Students will use spatial reasoning to describe, identify, and create geometric shapes. Students will visualize and identify geometric shapes after applying transformations:

- a. Identify and draw lines of symmetry on triangles, squares, circles, and rectangles.
- b. Determine the effect of a slide (translation), or a flip (reflection), on a figure using manipulatives.
- c. Determine whether two polygons are congruent by sliding, flipping, or turning to physically fit one object on top of the other.
- d. Relate cubes, cylinders, cones, and rectangular prisms to the two dimensional shapes from which they were created.

In Art: Expressing meaning in Art:

- a. Create symbols in artwork that express student, class, or community interests.
- b. Paint with complimentary colors.
- c. Discuss how the elements and principles of art help artists express their ideas.

Materials:

-art paper (9 x 12) or larger
-4 inch square cardstock
-tape
-scissors

-paint or colored pencils

Background:

In this activity, students will be creating art by reproducing shapes in a pattern. This activity assumes an ample understanding of a prerequisite knowledge base in essential geometry vocabulary, such as slide, reflection, and rotation. Students should have had numerous experiences with geometrical manipulatives, including equilateral triangles, squares and hexagons, which can be rotated at the corners, (vertex), to create unending tile patterns. Logon to “Cool Math 4 Kids” for related activities. If students are to understand the mathematical possibilities of how irregular shapes tessellate, they should first understand how regular geometric shapes tessellate. They do this by creating tessellation tiles with equilateral triangles, squares and hexagons. Also, use wooden pattern blocks, pattern block cards, string design, and mirrors, for classroom activities with **symmetry**.

For exploring **reflection, rotation and tessellations**, I use activities designed around the following sources, all of which are listed in **Teacher Resources and References**: tessellation manipulatives, tessellation template, “Squids and Rays” Tessellating Puzzles, and several prints and three dimensional forms created by M. C. Escher.

Often, an aesthetic focus of tessellations is the creation of both **positive and negative forms** in their designs. Teachers can help their students understand crucial elements of positive/negative forms by exposing them to such concepts in art. Examples can be found in art that contrasts background and foreground, positive and negative exposure in photography, and the contrasts of lights and darks.

Another aesthetic focus of tessellations is in the contrast of color, and specifically, **complementary color**. Students should be encouraged to experiment with complimentary color contrasts.

Summary of Activity:

Students will create a tessellating pattern and share their discoveries with the class.

Instructional Procedure

1. Design the pattern for the tessellations on a four inch square piece of cardstock. Draw an undulating line from the upper right corner to the lower right corner. Cut off the right side of your cardstock along your pencil line. Using a translation (slide), move your cutaway over to the left side of the square and trace it, in the same position, but on the left side. Then cut along this pencil line.
2. Repeat the process for the top and bottom portions of your square.

3. Now you are ready to create your tile pattern, using your prototype shape cut from the square. Take your design and trace it, repeating the shape, until your art paper is covered.
4. Be creative and make designs that can be drawn on your prototype. Choose designs that have meaning to you, including some that are reflective of your environment. Repeat this design on each shape that you have drawn on your art paper.

Extensions for Math and Art -

Make a study of the artworks of M.C. Escher, create a collection of prints and other tessellation materials. Use data from your finds to inspire mathematical observations and equations; create art that is reflective of your finds and explores your imagination.

Indicators of Success in Accomplishing Lesson Goals –

How can you and/or your students evaluate their completed artwork? Indicators of success in accomplishing their goals can be directly linked to your students' abilities to self-assess their own artwork. Consider the following: Have I made the objectives of the lesson clear to my students? If my students understand that the objectives of the lesson are as listed below, can they give me clear examples and descriptions of what their artwork might look like? Can they brainstorm what kinds of criteria might be exemplified in outstanding work? Can I positively affect the success of my students by having this discussion with them before they begin the art activity?

Sample Lesson Objectives:

- a. Students create a tessellation of repeated shapes.
- b. Students create symbolic designs that reflect their own interests.
- c. Students use complimentary colors.

Teacher Resources and References –

Educators Outlet, www.educatorsoutlet.com

“Fantastic World of Escher,” distributed by Atlas Video, available through Educatorsoutlet.com (This video is a teacher resource).

Giftwraps by Artists: M.C. Escher, Edited by Eric Hummel, Harry N. Abrams Publishing, 1987. ISBN 0-8109-2957-0

M.C. Escher Kaleidocycles, Doris Schattschneider & Wallace Walker, Pomegranate Books, Inc., Corte Madera, Calif. 1977. ISBN 0-87654-208-9

M.C. Escher 1999 Calendar, Published by Pomegranate

M. C. Escher, The Graphic Work: Introduced and Explained by the Artist, Translated, edited and published by Barnes & Noble, 2001. ISBN 0-7607-0180-6

Mirrors, LER 0266 Learningresources.com

Pattern Blocks, LER 01234, Learningresources.com

Pattern Block Cards, LER 0264, Learningresources.com

Slides, Flips, Turns, Louis R. Kroner, Pearson Education, Inc. Parsippany, N.J., 1994
ISBN 0-86651-730-8

“Squids and Rays Puzzellations,” available through Educators Outlet

“String Design,” available through Educatorsoutlet.com

“Tessellation Pack,” available through Educatorsoutlet.com

“Tessellation Template,” available through Educatorsoutlet.com

www.coolmath4kids.com/tessag1.html

www.nga.gov/collection/gallery/ggescher/ggescher-mail1.html

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